CASE REPORT – OPEN ACCESS

International Journal of Surgery Case Reports 3 (2012) 218–221

Contents lists available at SciVerse ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.elsevier.com/locate/ijscr

Unusual treatment of abdominal aortic aneurysm: Aortic stenting with covered stent

L. Garriboli*, A.M. Jannello

Department of Vascular Surgery, H. Sacro Cuore Don Calabria, Negrar (Vr), Italy

ARTICLE INFO

Article history:
Received 7 February 2012
Received in revised form 10 February 2012
Accepted 15 February 2012
Available online 20 February 2012

Keywords:
Aortic aneurysm
Cover stent
Endoprosthesis

ABSTRACT

INTRODUCTION: It is now becoming increasingly difficult to accept that some patients are not suitable for surgery due to high surgical risk. The continuous technological progress, in the endovascular field in particular, are urging surgeons to put the limit even more forth.
PRESENTATION OF CASE: We are going to describe an endovascular option used to treat an infrarenal aortic aneurysm where the diameter of the iliac vessels couldn't allow the use of any device available on the market. Three covered AdvantaV12 stents were placed in series in the aorta to build the endoprosthesis body and two Bard Fluency 8 mm × 60 mm were then placed in a "kissing way" into the common iliac arteries like legs.
DISCUSSION: Continuous technological progress, particularly in the endovascular field, is driving surgeons to push the limits even further. Nevertheless, some things still seem not to be possible, but in comparison to traditional surgery where all is well demonstrated and documented, the endovascular approach is still a young discipline and allows us to try to find new solutions.
CONCLUSION: We can therefore assert that in exceptional circumstances, an aortic endoprosthesis can be built inside the aortic lumen using covered stents.

1. Introduction

Abdominal aortic aneurysms (AAA) may be treated either through open surgical replacement with an artificial graft or placement of an endoluminal stent-graft. The techniques have similar long-term morbidity and mortality profiles in low risk patients. While the risks associated with open surgery increase with increasing patient comorbidities, endovascular repair maintains a good safety profile.[1,2] The choice of technique is influenced by morphological characteristics of the aneurysm and arterial branches[3,4] because endovascular devices achieve successful results only if matched with arteries of appropriate length, diameter and tortuousness. If these conditions are not met, the endovascular technique must be abandoned in favour of a traditional open repair. We present an alternative endovascular option that used to treat an infra-renal aortic aneurysm. The diameter of the patient's iliac vessels did not allow the use of any commercially available device. Instead, we constructed an aortic endo-prosthesis within the aortic lumen using covered and bare metal stents and achieved optimal sac exclusion.

2. Presentation of case

A 78 year-old man with hypertension, hypercholesterolaemia, previous myocardial infarction and obesity was referred with an infra-renal AAA. The AAA had increased in size from 40 mm to 51 mm maximum diameter over the previous 12 months. He was paraplegic following a spinal injury and had a permanent colostomy following colorectal cancer treatment. The medical history and the patient's obesity suggested an endovascular approach would be favourable.

Further study of the vascular anatomy was performed by a computed tomography scan. Reconstructed images demonstrated a 19 mm aortic diameter just below the renal arteries and 3 cm neck between the renal arteries and the fusiform 52 mm wide AAA. However, the common iliac arteries were less than 6 mm maximum diameter while his external iliac arteries measured less than 4.5 mm maximum diameter (Fig. 1). These iliac vessel dimensions were unsuitable for use of any commercially available stent-graft.

Bilateral percutaneous vascular access was obtained through the femoral arteries and a 12F, 30 cm long introducer was inserted via the right side to reach the aorta. On the left side, a 6F 11 cm long introducer was inserted. The patient was systemically anticoagulated using a 5000IU heparin bolus. Via the 12F sheath, three covered Advanta V12 stents mounted on a 16 mm balloon were placed in series in the aorta. The most proximal stent was placed just below the renal artery origin and dilated with a Cordis Opta Pro XL 18 mm × 40 mm balloon; while the remaining stents were then overlapped in series as far as the bifurcation. In order to

* Corresponding author at: U.O. Chirurgia Vascolare, H. SacroCuore Don Calabria, Via Don SempreBoni 5, 37024 Negrar (Verona), Italy. Tel.: +39 3388433121; fax: +39 0456013830.
E-mail address: luca.garriboli@gmail.com (L. Garriboli).

2210-2612
doi:10.1016/j.ijscr.2012.02.002

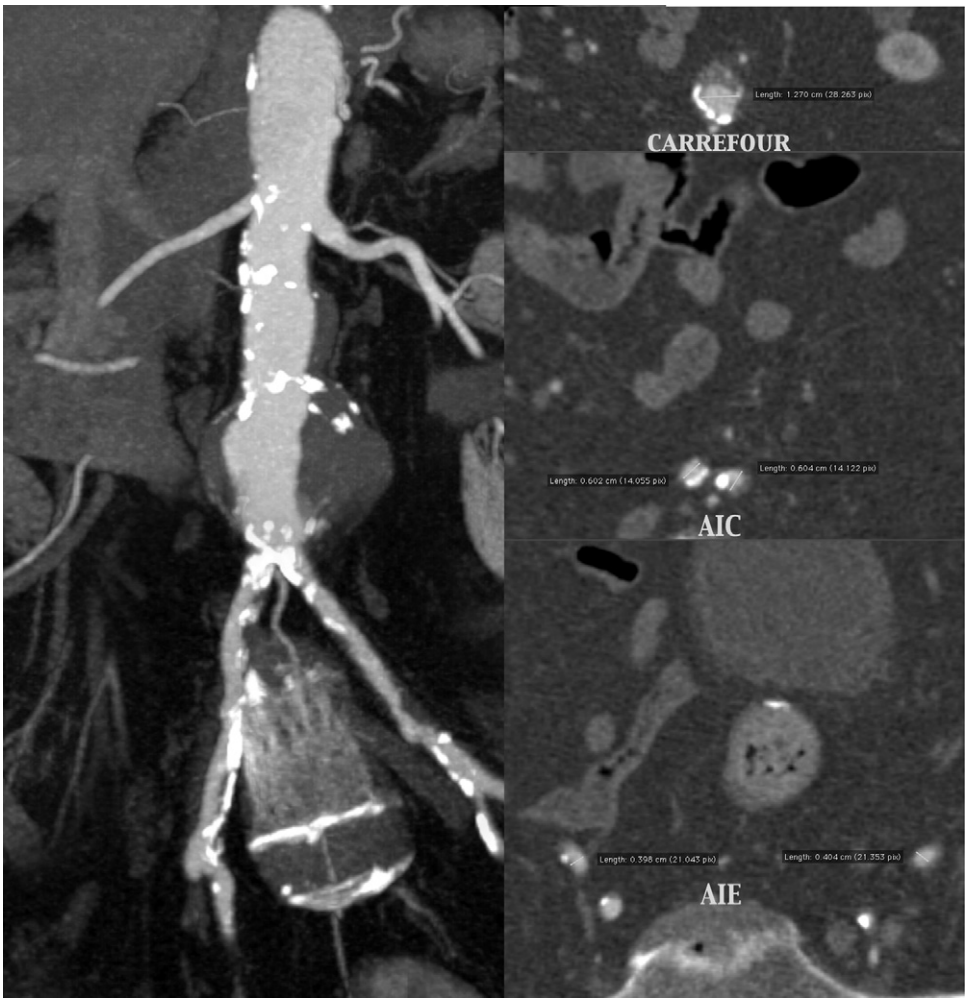

Fig. 1. AngioCT scan showing a large infrarenal aneurysm with very small iliac arteries.

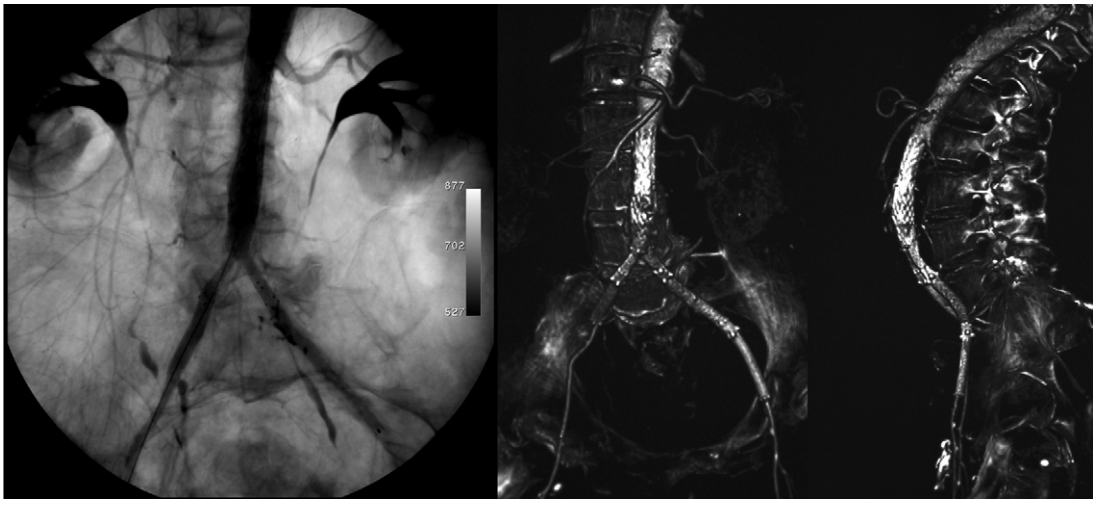

Fig. 2. Final intraoperative angiogram and 6-months AngioCT scan reconstruction.

stabilize this construction we deployed a Cordis Palmaz Genesis P4014 stent mounted on a Cordis Opta Pro XL 20 mm × 40 mm balloon between the distal and the two proximal stents. The 20 mm balloon was also used to mould the proximal stent within the aneurysm neck. A 5% stent oversizing within the neck was deemed acceptable, as the Advanta covered stents have different biomechanical properties to commercial aortic stent-grafts. Two graft Bard Fluency 8 mm × 60 mm covered stents were then placed "kissing" in the common iliac arteries extending 2 cm above the bifurcation. On the right side, a further 8 m × 60m stent was required in the distal common iliac artery in order to correct an intimal dissection flap. On the left side a Nitinol Bard Luminex

Stent 9 mm × 80 mm and a Cordis SMART stent 7 mm × 60 mm were placed in series until the origin of the internal iliac artery in order to correct an extensive dissection of the common iliac artery. Completion angiography confirmed successful placement of the aortic stents in the aneurysm without leakage and with preserved flow in the renal and iliac arteries (Fig. 2). The patient was discharged on the fifth post operative day after three view X-rays showed correct positioning of all devices without any gap between the stents; and colour Doppler ultrasound evaluation confirmed that the flow in the visceral arteries was preserved and there was no leakage from the aneurysm. A CT scan (Fig. 2) at 6 months demonstrated continued exclusion of the aortic aneurysm without leakage, stability of aneurysmal diameter (50 mm) and preserved flow in the visceral and iliac arteries. The aneurysm diameter remained stable at 1 year on ultrasound evaluation.

3. Discussion

It is now becoming increasingly difficult to accept that some patients are not suitable for open surgery due to high surgical risk. Continuous technological progress, particularly in the endovascular field, is driving surgeons to push the limits even further. Endovascular approach is a young discipline with considerable scope for the identification of novel solutions.[5,6] In the patient presented, the impossibility of using a traditional endovascular device and the high surgical risk forced us to try an alternative approach, referring to the reported experiences of other interventionists.[7] Achari and Krajcer reported 12 patients in whom they treated infra-renal AAAs by combining metallic Wallstent positioning with coil embolization of the aneurysm sacs. The premise of their technique was that the stent could create a laminar one-way flow that could progressively exclude the aneurysm, where the coils could promote thrombosis. Moreover it was supposed that the growth of new endothelium inside the stent over the first 4 weeks would lend stability to the entire structure.

The feasibility of this technique was already proved in canine models by Ruiz et al. in 1995.[8]

The five dogs treated with bare metal stents and coil embolization for AAA showed a reduction of the aneurysm size and sac thrombosis 1 month after the operation.

Moreover the histological examination of the stent showed the growth of a neointimal layer consisting mainly of myofibroblasts. The results achieved by these authors have been encouraging, as Villareal et al.[9] confirmed in 2001. Conversely, Boccalandro et al.[10] in 2005 compared the Ancore Endoprosthesis (Medtronic) with bare metallic stents and coil embolization in a small group of patients with an infra-renal AAA unsuitable for surgery. The results showed clear superiority of endoprosthesis for complete exclusion of the aneurysm with better control of sac expansion and reduced risk of rupture.

In our case we chose the covered stent in order to avoid the use of coils in the aneurysm that was already largely thrombosed. Moreover, this technique has been consolidated and used by different authors for the treatment of aneurysmal disease associated with thoracic aortic coarctation.[11–13] The long proximal neck made us confident of correctly positioning the stent with a low risk of occluding visceral arteries. We chose to dilate the proximal stent only with 20 mm balloon because the length and uniformity of the neck assured safe adherence to the aortic wall without risk of proximal endoleaks. Moreover, in order to improve stability and to avoid any type I distal leak, we deployed a further covered stent into the two common iliac arteries, overlapping them into the aortic stents. It was difficult to position the distal aortic stent, because it could not be 'rested' on the bifurcation due to the risk of rupturing the common iliac artery with the protruding part of the balloon on which the stent was mounted. Another difficulty arose in placing the proximal stent in the desired position just below the renal arteries, because shortening after balloon dilatation made it difficult to predict the final level of the stent. To overcome this, we first used a smaller balloon in comparison to the neck size and by virtue of this and the ePTFE covering of the stent we were able to position the graft accurately. Once the correct location was achieved, all three aortic stents were fixed to the aortic wall by over-dilation with a suitably sized balloon. The decision to insert an additional Palmaz stent with high radial strength provided reinforcement the covered stents. The stenting of the common iliac arteries was not planned but became necessary to treat iatrogenic damage by the introducers and devices, despite their small size. This confirms the impossibility of using any other endovascular device.

The technique we adopted proved feasible with good medium and long term results.

4. Conclusions

We can therefore assert that in exceptional circumstances, an aortic endo-prosthesis can be built inside the aortic lumen using covered stents or bare metal stents even if those devices are designed for other purposes.

Conflict of interest statement

None.

Funding

None.

Ethical approval

Yes, all legal right was been respected.

I have obtained written consent from the patient and I can provide this should the Editor ask to see it.

Author contributions

Luca Garriboli contributed conception and design, analysis and interpretation, data collection, writing, and critical revision of the article. Luca Garriboli along with Antonio Maria Jannello has done the final approval and endured overall responsibility.

References

1. Aarts F, van Sterkenburg S, Blankensteijn JD. Endovascular aneurysm repair versus open aneurysm repair: comparison of treatment outcome and procedure-related reintervention rate. *Ann Vasc Surg* 2005;**19**:699–704.
2. García-Madrid C, Josa M, Riambau V, Mestres CA, Muntaña J, Mulet J. Endovascular versus open surgical repair of abdominal aortic aneurysm: a comparison of early and intermediate results in patients suitable for both techniques. *Eur J Vasc Endovasc Surg* 2004;**28**:365–72.
3. Eliason JL, Upchurch GR. Endovascular treatment of aortic aneurysms: state of the art. *Curr Treat Options Cardiovasc Med* 2009;**11**:136–45.
4. Hinchliffe R, Ivancev K. Endovascular aneurysm repair: current and future status. *Cardiovasc Interv Radiol* 2008;**31**:451–9.
5. Chuter TA, Parodi JC, Lawrence-Brown M. Management of abdominal aortic aneurysm: a decade of progress. *J Endovasc Ther* 2004;**11**:II82–195.
6. Becquemin JP, Desgranges P, Kobeiter H. Endoprostheses for aneurysms of the abdominal aorta [A technical innovation, a cultural revolution]. *Presse Med* 2001;**30**:1216–23.
7. Achari A, Krajcer Z. A novel method for endoluminal treatment of abdominal aortic aneurysms. With bare-metal Wallstent endoprostheses and endovascular coils. *Tex Heart Inst J* 1998;**25**:44–8.
8. Ruiz CE, Zhang HP, Douglas JT, Zuppan CW, Kean CJ. A novel method for treatment of abdominal aortic aneurysms using percutaneous implantation of a newly designed endovascular device. *Circulation* 1995;**91**:2470–7.

9. Villareal RP, Kar B, Howell MH, Strickman N, Kraczer Z. Bare metal stents with or without coil embolization for abdominal aortic aneurysm exclusion in high-risk patients. *Catheter Cardiovasc Interv* 2001;**54**:12–8.
10. Boccalandro F, Cohen A, Raval B, et al. Superiority of endovascular grafts compared to bare metal stents with transstent coil embolization for endovascular abdominal aortic aneurysm repair in patients at high risk for surgery. *Catheter Cardiovasc Interv* 2005;**64**:283–90.
11. Tanous D, Collins N, Dehghani P, Benson LN, Horlick EM. Covered stents in the management of coarctation of the aorta in the adult: initial results and 1-year angiographic and hemodynamic follow-up. *Int J Cardiol* 2010;**140**: 287–95.
12. Rothman A, Mayman GA, Evans WN, Berthoty DL. Overlapping covered stents to exclude a postcoarctation stenting aortic aneurysm. *Pediatr Cardiol* 2008;**29**:962–5.
13. Suárez de Lezo J, Pan M, Romero M, et al. Percutaneous interventions on severe coarctation of the aorta: a 21-year experience. *Pediatr Cardiol* 2005;**26**: 176–89.